Open-Source Software Practice

Lab 03. Git Advanced

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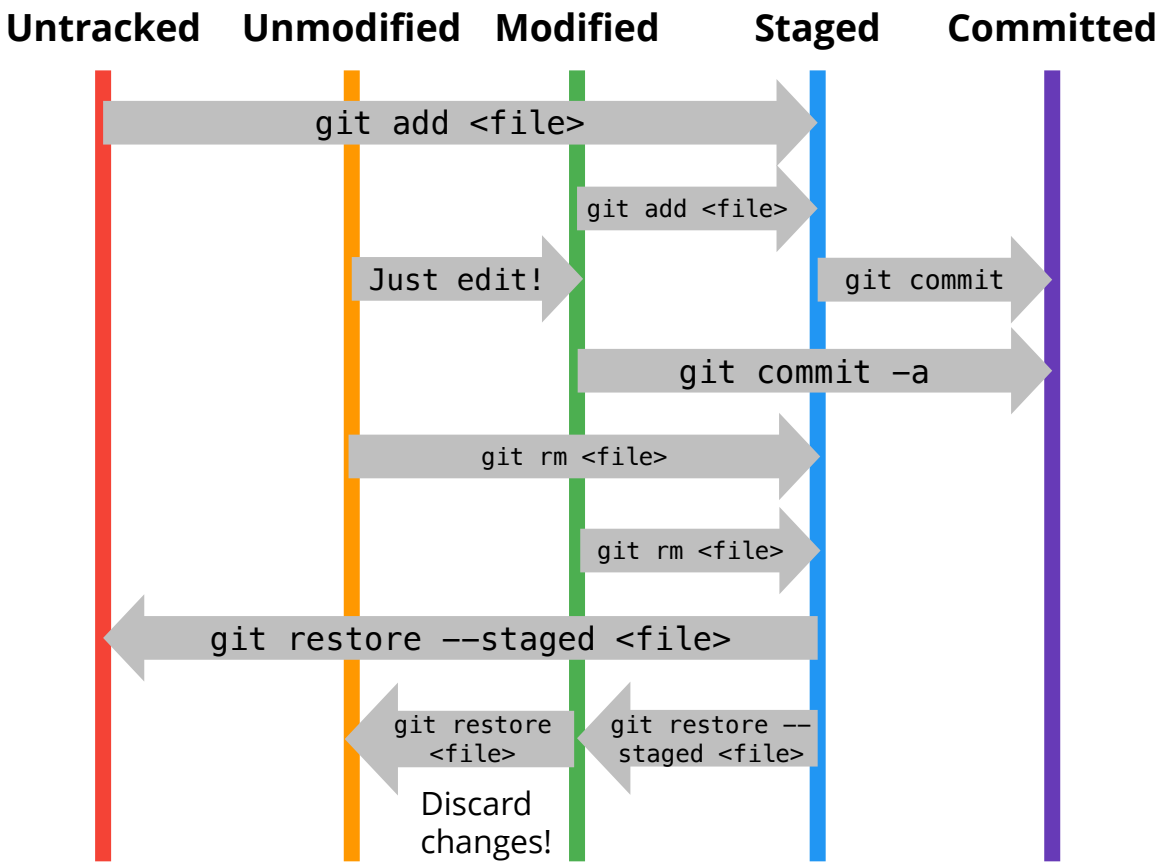
Review: Git Basics



Goals

1. Branching
2. Merging
3. Resolving conflicts
4. Sign up for GitHub
5. Create a repository on GitHub
6. Working with remotes

Let’s Practice – 1 (init)

```
1. git init
2. echo “Initial README” >> README.md
3. git add README.md
4. git commit
```

Let’s Practice – 2 (creating a branch)

1. `git branch`
2. `git branch dev`
3. `git branch`
4. `git checkout dev`
5. `git branch`

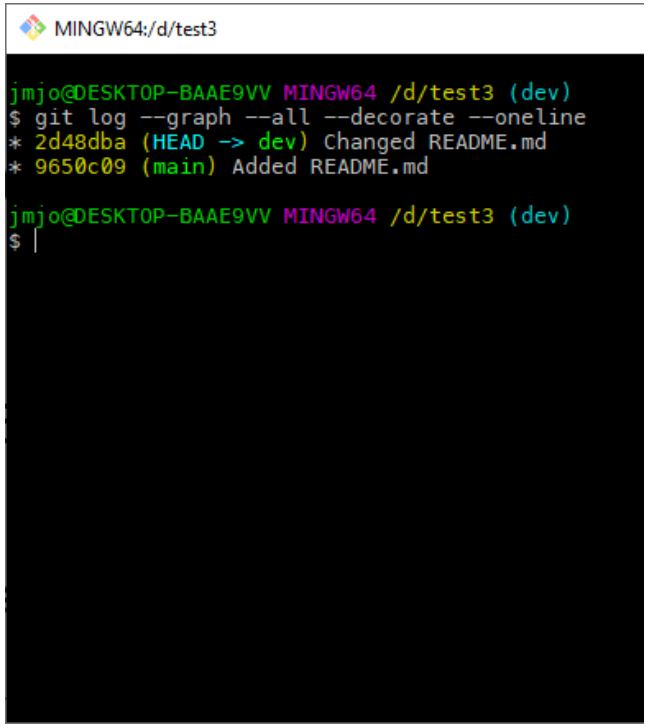
MINGW64:/d/test

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (main)
$ git branch
* main

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (main)
$ git branch dev

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (main)
$ git branch
  dev
* main

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (main)
$ git checkout dev
Switched to branch 'dev'

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (dev)
$ git branch
* dev
  main

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test (dev)
$ |
```

Let’s Practice – 3 (commit)

- You are on the *dev* branch.

1. `echo “Change on dev” >> README.md`
2. `git add .`
3. `git commit –m “Changed README.md”`
4. `git log --graph --all --decorate --oneline`



Let’s Practice – 4 (going back to main)

- You are on the *dev* branch.

1. `git checkout main`
2. Open README.md and check out that the last change you made (on the *dev* branch) was reverted.
3. `echo “Change on main” >> README.md`
4. `git add .`
5. `git commit –m “Changed README.md` *`for the second time`*”
6. `git log --graph --all --decorate --oneline`

Let’s Practice - 4

MINGW64:/d/test3

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main)
$ git log --graph --all --decorate --oneline
* 6f73f38 (HEAD -> main) Changed README.md for the second time
| * 2d48dba (dev) Changed README.md
|/
* 9650c09 Added README.md

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main)
$
```

Let’s Practice – 5 (merging)

- You should be on the *main* branch. Otherwise, `git checkout main`

1. `git merge dev`
   - The *dev* branch does not change. We only change the branch we are currently on, *main*.
2. Check out the error message.
3. `git status`

Let’s Practice – 5 (merging)

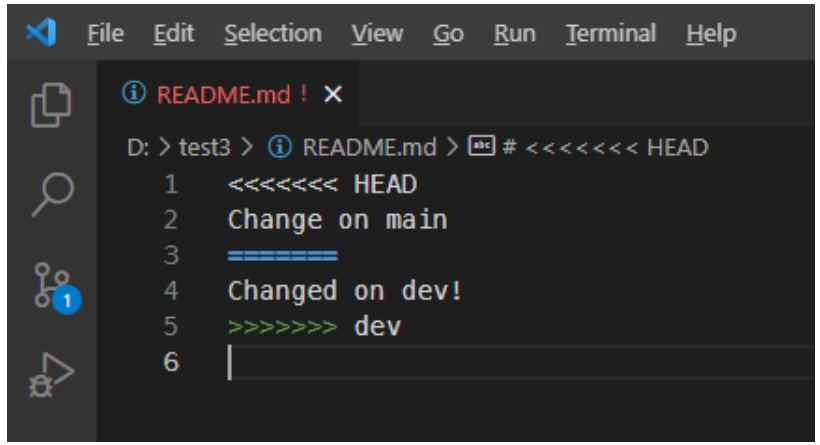
- Check out the hints from Git.

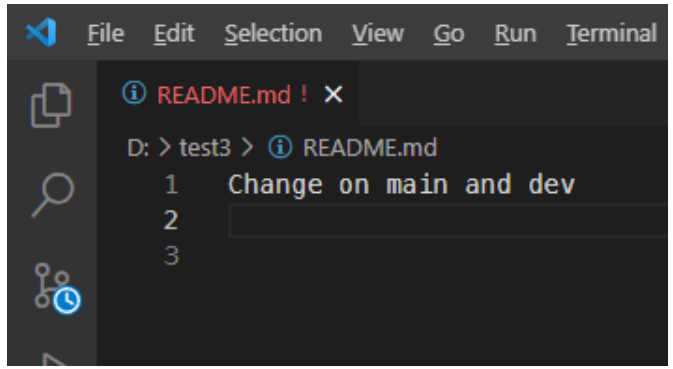
MINGW64:/d/test3

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main)
$ git merge dev
Auto-merging README.md
CONFLICT (content): Merge conflict in README.md
Automatic merge failed; fix conflicts and then commit the result.

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main|MERGING)
$ git status
On branch main
You have unmerged paths.
  (fix conflicts and run "git commit")
  (use "git merge --abort" to abort the merge)

Unmerged paths:
  (use "git add <file>..." to mark resolution)
        both modified:   README.md

no changes added to commit (use "git add" and/or "git commit -a")

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main|MERGING)
$
```

Let’s Practice – 6 (resolving conflicts)

1. Open *README.md* and edit
2. `git add .`
3. `git status`
4. `git commit –m “Merged dev”`
5. `git log --graph --all --decorate --oneline`



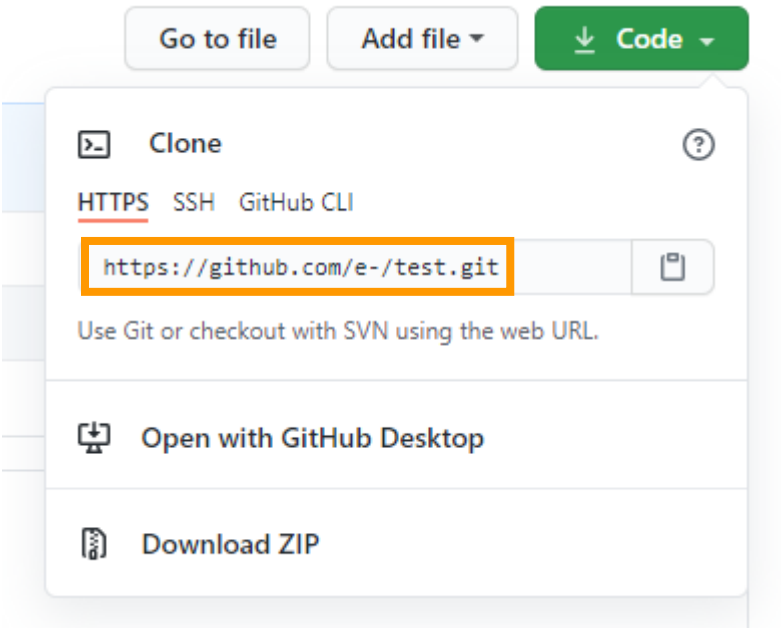


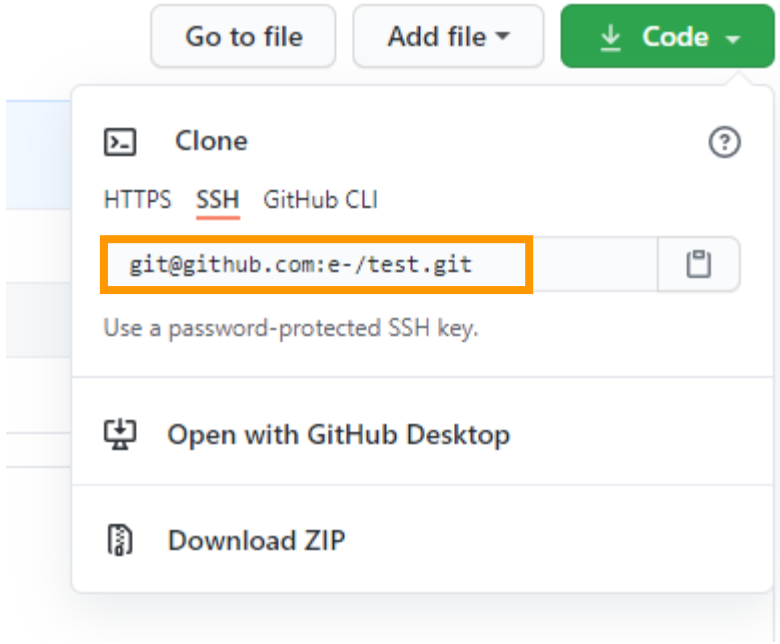
Let’s Practice – 6 (resolving conflicts)

MINGW64:/d/test3

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main)
$ git log --graph --all --decorate --oneline
*   2022f7c (HEAD -> main) Merged dev
|\
| * 2d48dba (dev) Changed README.md
* | 6f73f38 Changed README.md for the second time
|/
* 9650c09 Added README.md

jmjo@DESKTOP-BAAE9VV MINGW64 /d/test3 (main)
$
```

Cloning a Remote Repo





Cloning a Remote Repo

- You just want to see others' repo (i.e., read-only)
  - `git clone https://github.com/...`
  - The most convenient way
  - Requires log-in to push

- You want to change your repo
  - `git clone git@github.com:...`
  - Requires key registration to push

- You want to change others' repo (covered in the next class)
  - Be invited to the repo as a collaborator (rare), or
  - Fork the repo and clone *your* version of the repo.

Let’s Practice – 7 (cloning twbs)

- Navigate to a new directory. Make sure that you are not in a Git repo.

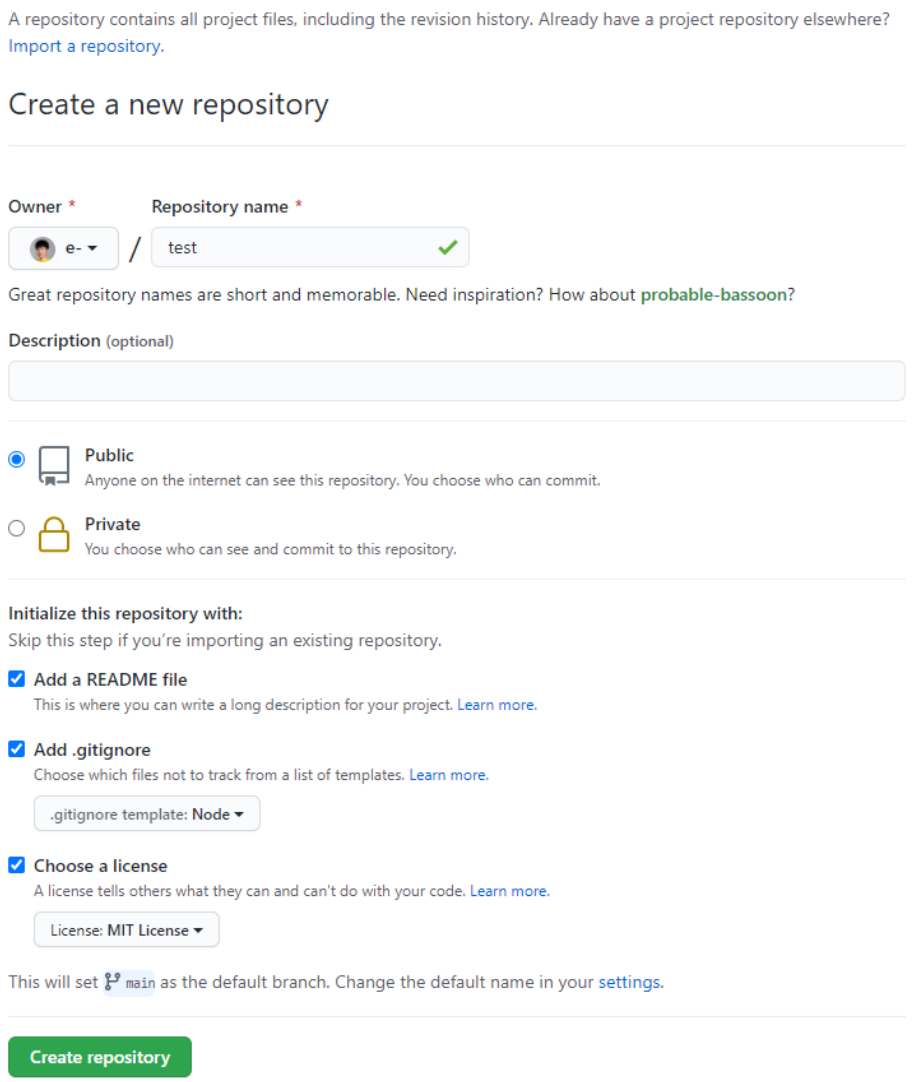
1. `git clone https://github.com/twbs/bootstrap`
2. `git branch --remote`
3. `git log --all --decorate --online --graph`
   - Page down or up to navigate, press ‘q’ to quit
4. Visit https://github.com/twbs/bootstrap to check the branch names and commits.

Let’s Practice – 7 (cloning)

1. Sign in to GitHub
2. Create a new repository
3. Clone the repo by `git clone git@github.com:...`

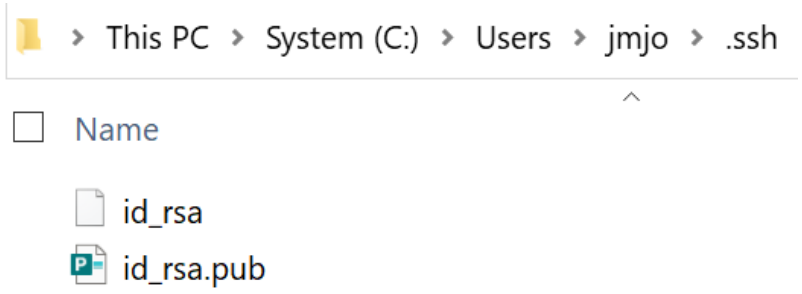
4. Error!

```
git@github.com: Permission denied (publickey).
fatal: Could not read from remote repository.

Please make sure you have the correct access rights
and the repository exists.
```



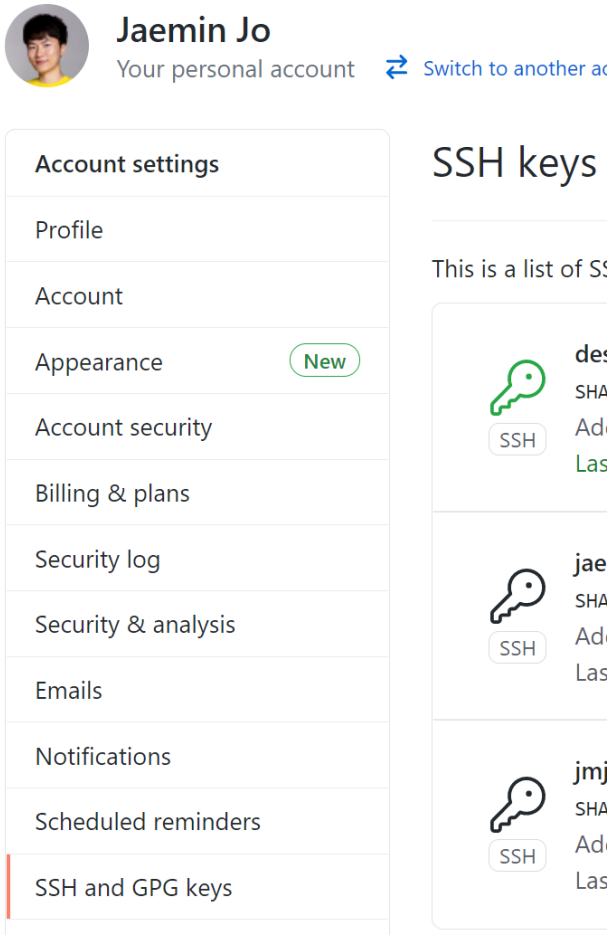
Let’s Practice – 8 (ssh-keygen)

1. Make sure keys do not exist: `ls ~/.ssh`
2. `ssh-keygen`
3. Use the default path
4. Enter the passphrase
   - A special password to use the keys
5. `cat ~/.ssh/id_rsa.pub`
6. Copy the public key and register it to GitHub



Let’s Practice – 9 (registering keys)

1. Go to SSH and GPG keys tab in Settings.
2. Enter your password again
3. Click on “New SSH Key”
4. Copy the content of **“id_rsa.pub”** to the form.
   - **NOT** “id_rsa”. This is your private key.



Let’s Practice – 10 (pushing)

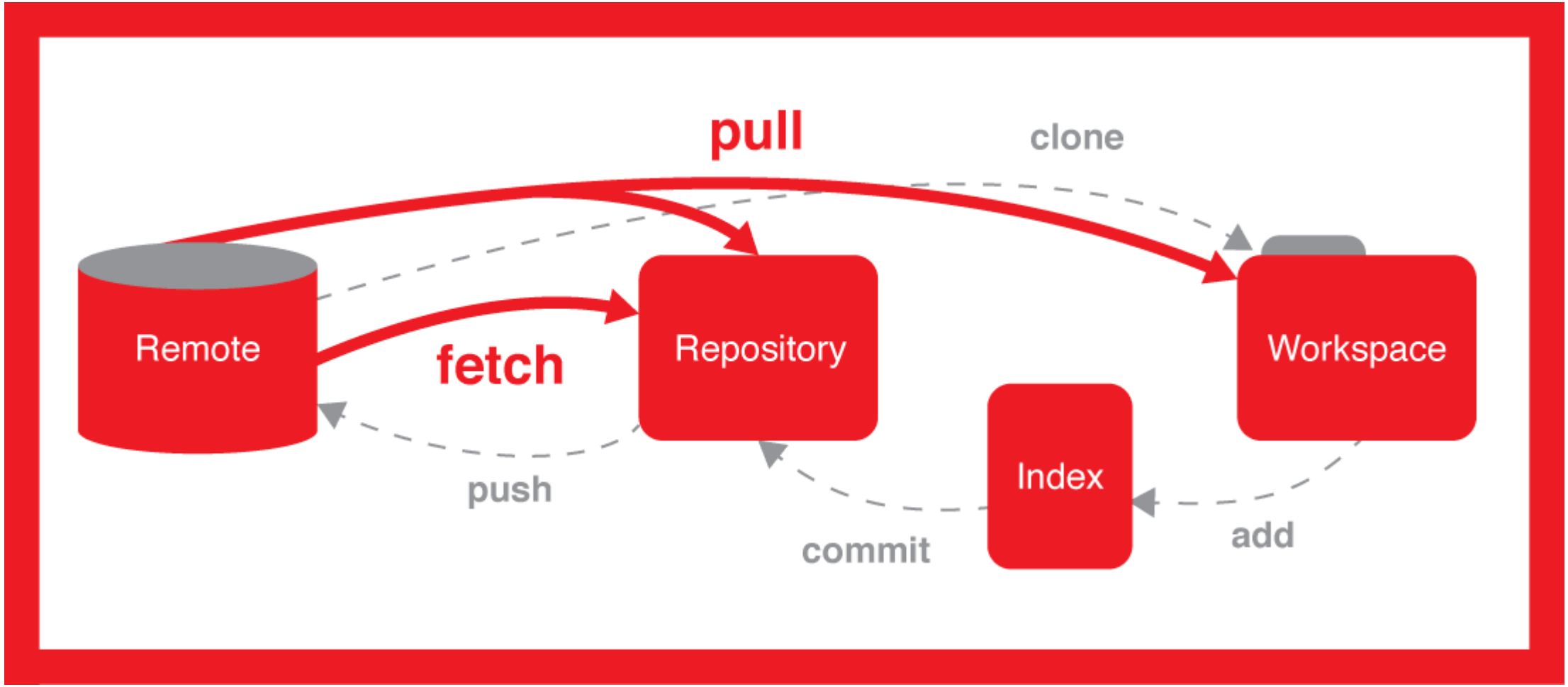
1. Initialize a Git repo: `git init`
   - If you already have one, skip this one.
2. Create a README.md file: `code README.md`
   - If you already have one, skip this one.
3. `git add .`
4. `git commit –m “Added README.md”`
5. `git remote add origin git@github.com:e-/test.git`
6. `git push --set-upstream origin main`

Let’s Practice – 10 (pushing)

- `git remote add origin <url>`
  - Register <url> as a remote repository with a name “origin”.
  - You can check out the remotes with `git remote –v`

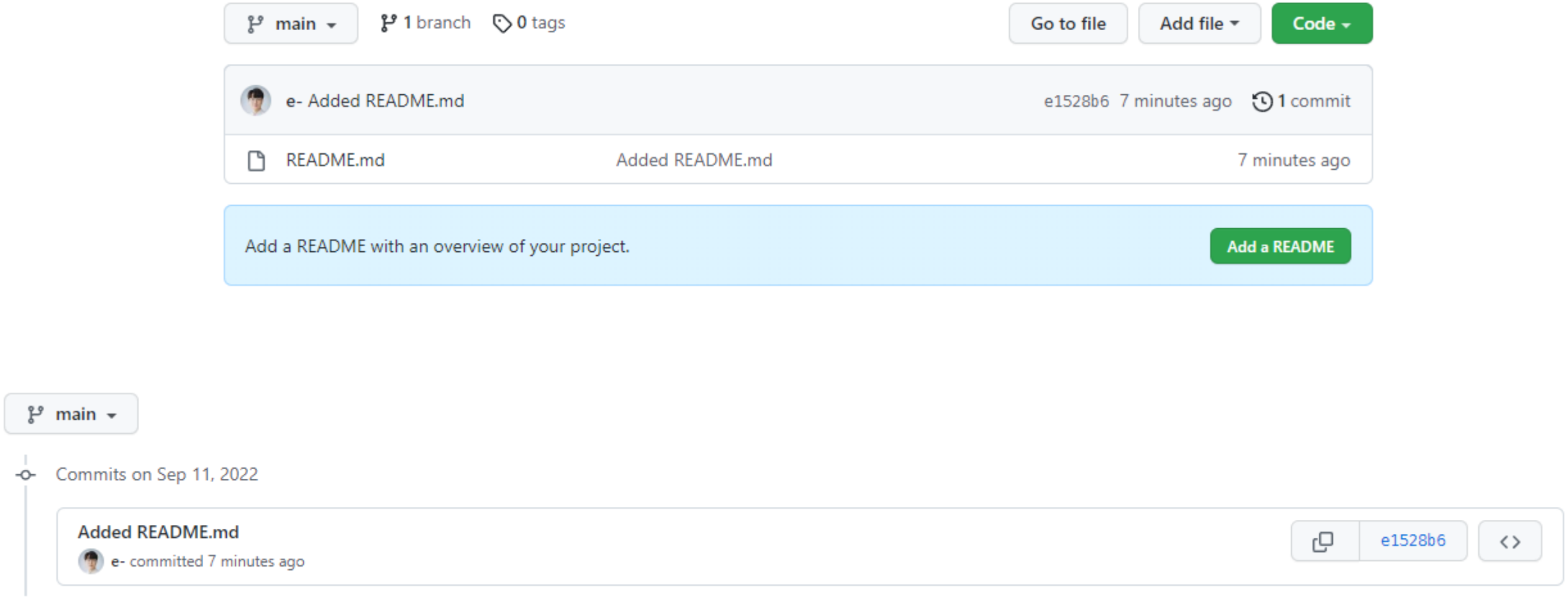
- `git push ––set–upstream origin main`
  - Set *origin* as the upstream and push the local repo to the remote.
  - Once the upstream is set, you can just `git push` to upload the changes.

Workflow



https://stackoverflow.com/questions/1783405/how-do-i-check-out-a-remote-git-branch

Check out the Result



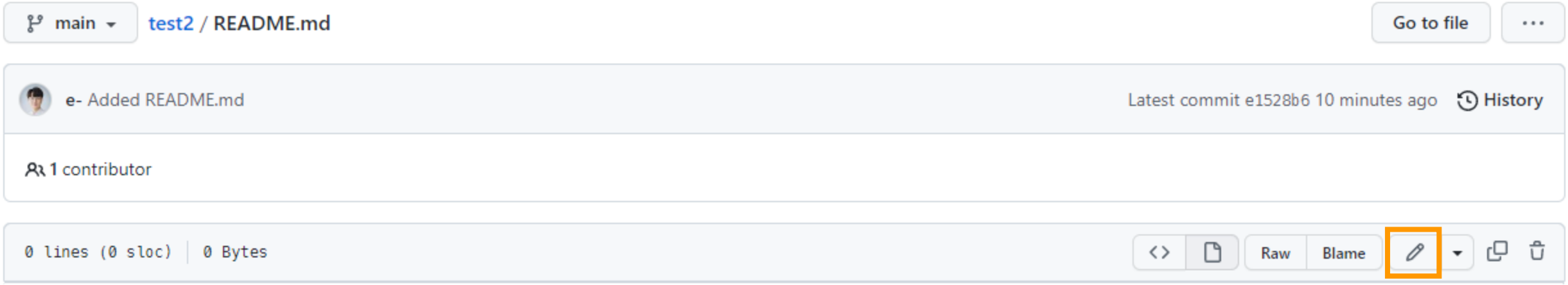
Let’s Practice – 11 (more pushing)

1. Add or change files
2. `git add .`
3. `git commit`
4. `git push`
   - You can omit the *--set-upstream* part since it is already set.

Let’s Practice – 12 (pulling)

- Suppose another person updated the remote repo, making your local repo outdated.

- To simulate this, let’s change README.md on GitHub.



test2 / README.md in main

Cancel changes

Edit file | Preview

Spaces 2 No wrap

```
1  Updated via GitHub
```

Commit changes

Update README.md

Add an optional extended description...

Let’s Practice – 12 (pulling)

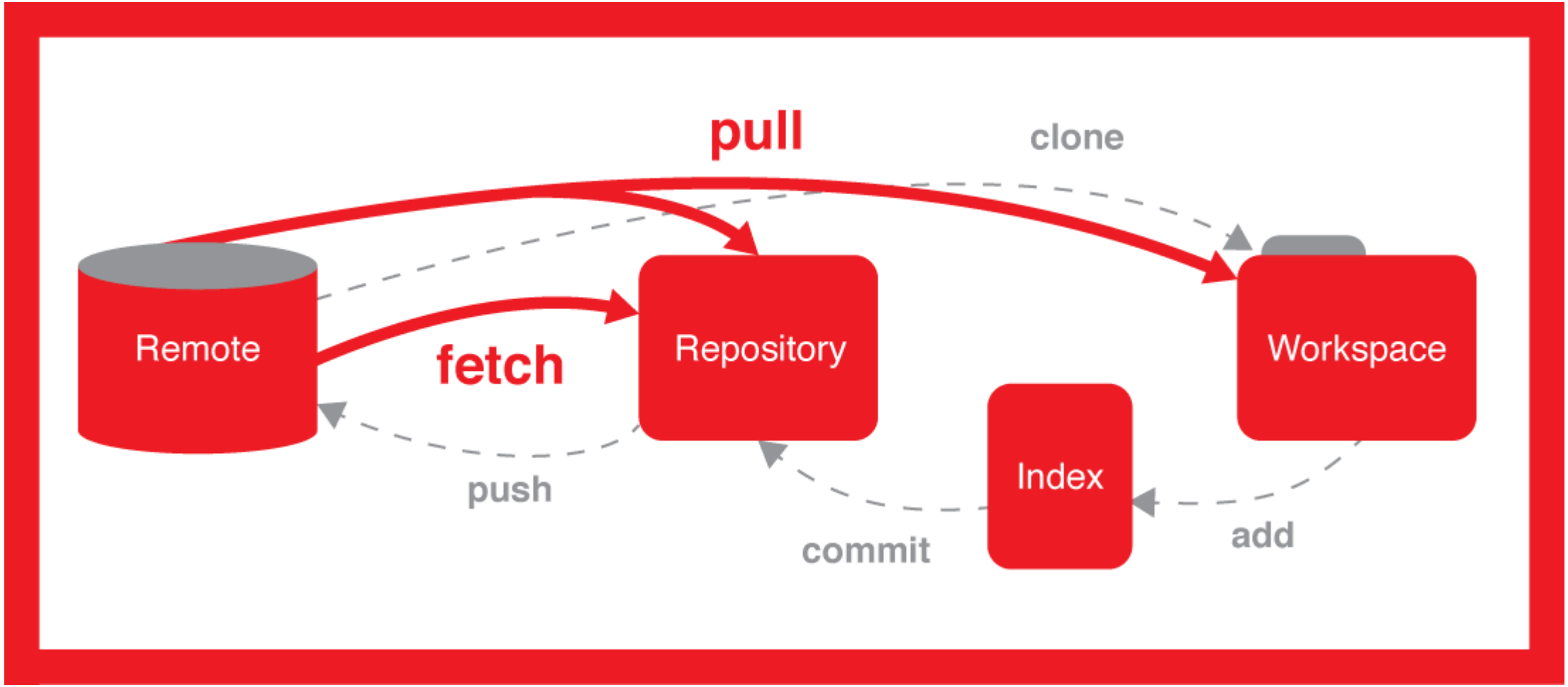
- Now, README.md in the remote is newer than one in the local.
- We need to pull the changes before updating the local version.

- `git pull`

MINGW64:/d/ossp/test2

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/ossp/test2 (main)
$ git pull
Enter passphrase for key '/c/Users/jmjo/.ssh/id_rsa':
remote: Enumerating objects: 5, done.
remote: Counting objects: 100% (5/5), done.
remote: Total 3 (delta 0), reused 0 (delta 0), pack-reused 0
Unpacking objects: 100% (3/3), 632 bytes | 79.00 KiB/s, done.
From github.com:e-/test2
   e1528b6..f92282b  main       -> origin/main
Updating e1528b6..f92282b
Fast-forward
 README.md | 1 +
 1 file changed, 1 insertion(+)

jmjo@DESKTOP-BAAE9VV MINGW64 /d/ossp/test2 (main)
$ |
```

Workflow



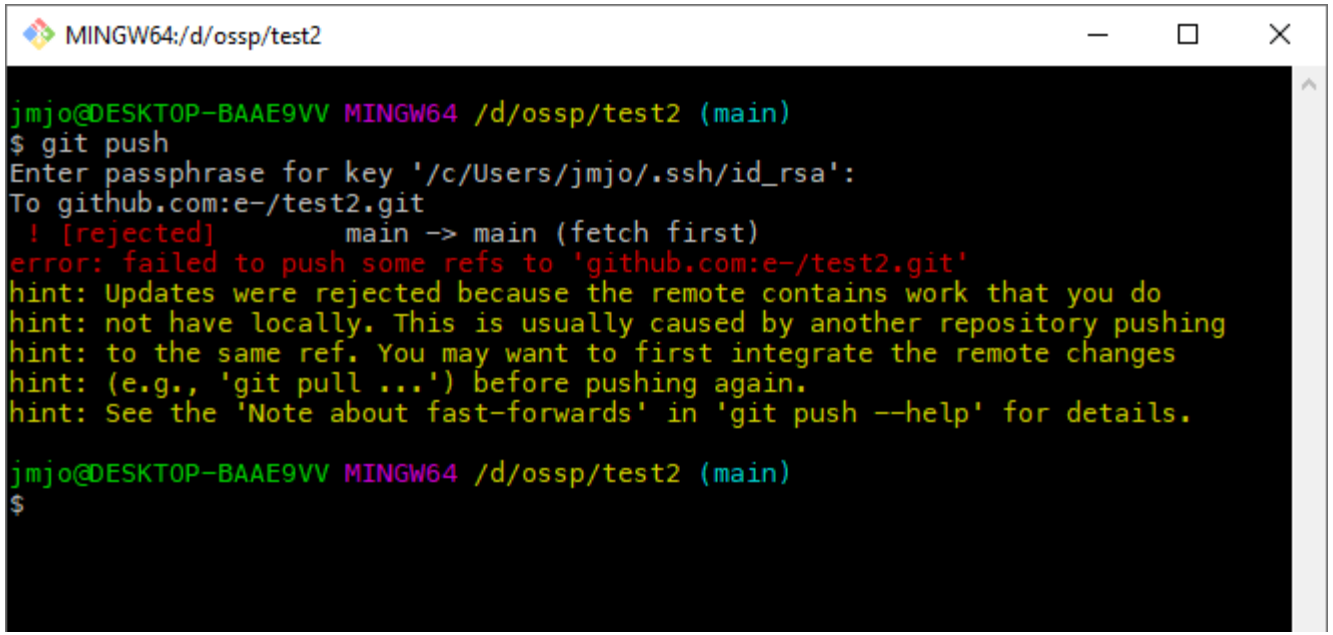
https://stackoverflow.com/questions/1783405/how-do-i-check-out-a-remote-git-branch

Pulling the Changes

- So, before changing the local code, always `git pull`.
- What happen if you change a file without or before pulling the new version?
- Let’s test this.

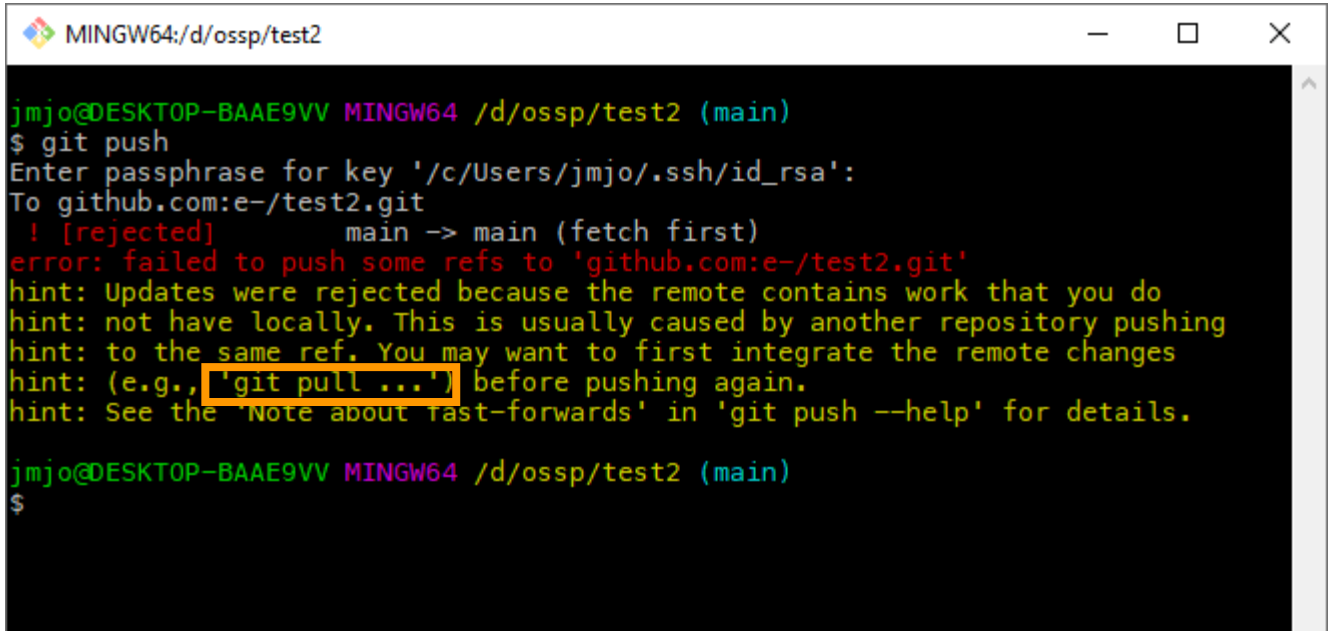
Let’s Practice – 13 (merge conflicts)

1. Update the remote README.md again via GitHub.
2. Change the local README.md and commit the change.
3. `git push`



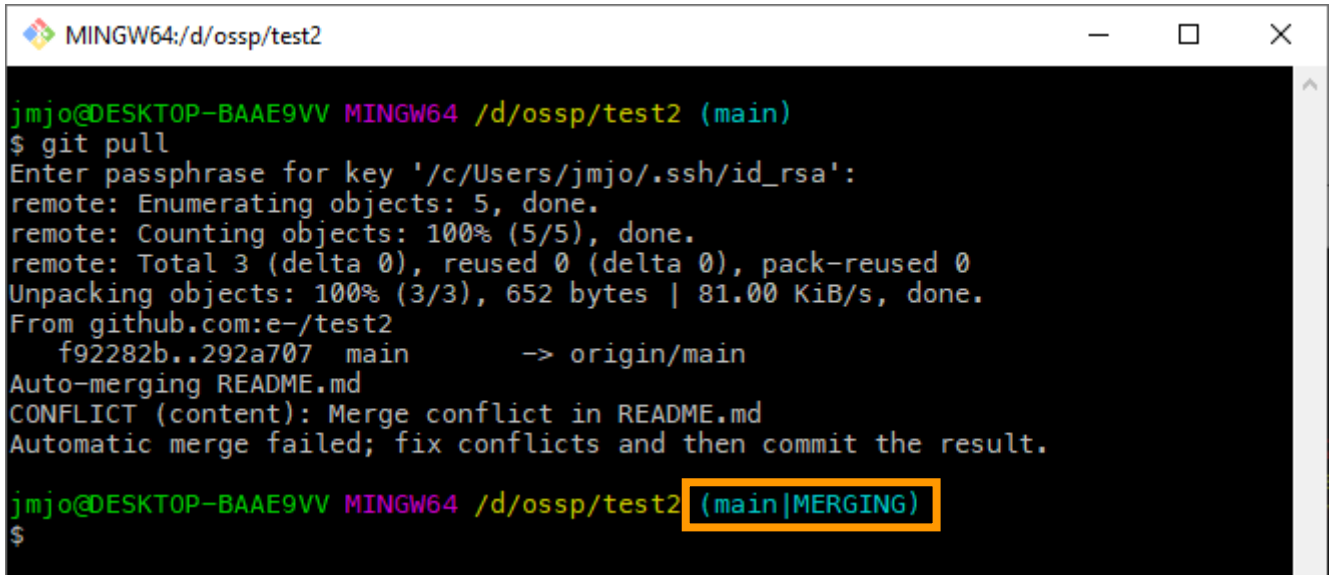
Let’s Practice – 13 (merge conflicts)

- The error message means that someone else has changed the remote while you are working, so you need to sync the changes first before pushing to the remote.
- `git pull`



Let’s Practice – 14 (resolving conflicts)

- You pulled the changes, but merge conflict happened.
- This is similar to merge conflict between branches.
- `code README.md`



Let’s Practice – 14 (resolving conflicts)

- Remove the conflict messages and resolve the conflict.
- `git add .`
- `git commit`
  - The default merging message is already there.

```
README.md !
D: > ossp > test2 > README.md > # <<<<<<< HEAD
<<<<<<< HEAD
Updated locally
=======
Updated via GitHub for the second time.
>>>>>>> 292a707f2857c88496a8bf4e1a5ec482a17633cd
```

```
COMMIT_EDITMSG
D: > ossp > test2 > .git > COMMIT_EDITMSG
Merge branch 'main' of github.com:e-/test2

# Conflicts:
#   README.md
```

```
README.md !
D: > ossp > test2 > README.md
Updated locally and via GitHub
```

Let’s Practice – 14 (resolving conflicts)

- `git push`

MINGW64:/d/ossp/test2

```
jmjo@DESKTOP-BAAE9VV MINGW64 /d/ossp/test2 (main)
$ git push
Enter passphrase for key '/c/Users/jmjo/.ssh/id_rsa':
Enumerating objects: 10, done.
Counting objects: 100% (10/10), done.
Delta compression using up to 32 threads
Compressing objects: 100% (2/2), done.
Writing objects: 100% (6/6), 548 bytes | 548.00 KiB/s, done.
Total 6 (delta 0), reused 0 (delta 0), pack-reused 0
To github.com:e-/test2.git
   292a707..204ae64  main -> main

jmjo@DESKTOP-BAAE9VV MINGW64 /d/ossp/test2 (main)
$
```

Pulling before Pushing

- Always remember that others can change the remote until the moment that you push. So, pull frequently.

- Don’t be afraid of merge conflicts. Search for “<<<“ and merge the contents between “=======“.

Questions..

- Can you make branches and push them? How can you check out the branch from the GitHub interface?

- Previously, we learned how to deal with modify/modify conflict? Can you make up a scenario for delete/modify conflicts?